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Bulletin No. 317 - Range Lands of Utah County and Their Utilization

L. A. Stoddart

RANGE LANDS OF UTAH COUNTY
and Their Utilization

By L. A. Stoddart

Bulletin 317
Agricultural Experiment Station Utah State Agricultural College
Logan Utah

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AGRICULTURAL EXPERIMENT STATION

Utah State Agricultural College

Logan, Utah

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FOREWORD

SINCE 1936, the Utah Agricultural Experiment Station has carried project 179 entitled "A study of agricultural resources of Utah and their utilization." The project is made up of the following four subphases: A, Agricultural economics; B, Soil resources; C, Irrigation water resources; and D, Range resources.

Under subproject D, "Range resources and condition of vegetation cover," surveys have been made of Duchesne and Uintah Counties[1], Wasatch County[2], and Rich County[3]. The field seasons of 1940 and 1941 were devoted to studies of the range resources of Utah County which are presented in the following report.

Appreciation is expressed of the cooperation and assistance given by the following in making available maps, survey data, and other information upon which this report is based: U. S. Agricultural Adjustment Administration, U. S. Army Engineers, U. S. Forest Service, U. S. Grazing Service, the U. S. Soil Conservation Service, and the Utah Agricultural Extension Service.

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[1] Range conditions in Uinta Basin, Utah. Utah Agr. Exp. Sta. Bul. 283. 1937.

[2] Range conservation in Wasatch County, Utah. Western range survey report. U. S. Forest Service. 1938. mimeo.

[3] Range resources of Rich County, Utah. Utah Agr. Exp. Sta. Bul. 291. 1940.

RANGE LANDS OF UATH COUNTY, UTAH AND THEIR UTILIZATION

L. A. STODDART[4]

INTRODUCTION

UTAH COUNTY, comprising about 1,394,760 acres, lies in the north central part of Utah immediately west of the precipitous Wasatch Mountains. These mountains, which occupy about the eastern half of the county, vary in elevation from 4,700 feet at the bench lands to 9,000 and 10,000 feet. Extreme elevations of 12,000 feet are found on the highest peaks. The western half of the county, although broken by small mountain ranges, is much more level, lower in elevation, and more arid. Whereas the mountainous eastern parts of the county are marked by higher precipitation and, consequently by relatively dense vegetation, mostly oak and aspen, the western half supports sparse vegetation, mostly sagebrush, juniper, or, in alkaline areas, saltbush.

Cultivation virtually is confined to a narrow belt along the Wasatch Mountain foothills where irrigation water is available from mountain streams. Utah Lake, approximately 93,000 acres in extent and lying in the center of the county, is a minor source of irrigation water. Although dry-land agriculture has been attempted in various localities within the county, it generally has proved unsuccessful with the exception of some 5,000 acres.

The population of the county, numbering 57,382[5] is centered along the foothills. The majority reside in urban communities, the chief among which are Provo, the county seat, with 18,071 people; Springville, 4,796; Spanish Fork, 4,167; Payson, 3,591; American Fork, 3,333; Orem, 2,914; Lehi, 2,733; and Pleasant Grove, 1,941. Rural settlement is limited, the majority of the rural population being people of the farm rather than ranch people in the usual sense.

Utah County is not primarily a range livestock county, but its heavy production of forage crops on farm land and the importance of ranges in this and adjacent counties make livestock production a major part of its agriculture. For this reason the study reported herein was initiated to analyze resources in the county for the production of range livestock and means for the utilization of these resources.

The findings reported are based upon a study of the vegetation, its amount, quality, and condition, and upon management problems discovered in the process of the study. Detailed field studies were made of all range lands within the county. Management practices and prob-

[4] Research professor of range management.
[5] 1939 estimates, known to have increased sharply.

lems discussed resulted from analysis of these studies and from the observations of operators and range administrators in the county.

Historical Records of Range Conditions

In the records of early explorers and settlers are found many references to the natural forage conditions in Utah County and, while these records are not wholly reliable, they do serve as an index to the condition of virgin or natural range. In general, these early visitors were neither botanists nor stockmen, but all were interested in feed for their animals, hence their observations were probably reasonably acute. In interpreting such records, however, it must be kept in mind that certain years and certain seasons of the year are drier than others; thus good range may have appeared poor in dry years and, conversely, poor range may have appeared good in wet years or in early spring.

Probably the first white men to reach Utah valley were Escalante and Dominguez who came down Spanish Fork Canyon enroute to California from New Mexico in 1776. Escalante wrote that throughout the whole valley there was good and abundant pasture. Adjacent hillsides also supported excellent vegetation which was considered adapted to the grazing of large droves of cattle and horses (5). It is of interest that, at the time of Escalante's arrival, Indians already inhabited Utah valley in large numbers and numerous deer and buffalo grazed the ranges (2).

Beginning about 1820, numerous trappers and hunters including Provost and Ashley entered the valley but left few records of the area.

Fremont arrived in Utah valley from the Sevier drainage in 1844 and found it "a handsome mountain valley covered with fine grass." East of the lake was a fertile plain generally covered with good bunchgrass which impressed the veteran Fremont as an "excellent locality for stock-farms." In Spanish Fork canyon, this party likewise found favorable conditions, for "everywhere the mountain shows grass and timber" (1).

Jesse C. Little, in 1847, was probably the first of the Mormon pioneers to explore Utah valley (2), however he was followed by such men as Oliver B. Huntington in 1848, John S. Higbee in 1849, and William Miller in 1850. In 1848, Huntington found that the dry bunchgrass east of Utah Lake projected 6 inches above a 12 inch snow and provided excellent feed for his horses. Other pioneers, in 1850, found "acres of waving grass" and were able to make hay from the wild grasses (4). A large quantity of grass was cut with a scythe and the land was then grazed, still supporting grass sufficient to satisfy the animals until Christmas. Of both bunchgrass and meadow grass there was "far more than in later times" (2).

Another party, in 1850, found parts of the valley covered largely with sagebrush which had greasewood and bunchgrass intermixed (2).

Simpson (5) reported in some detail upon areas of Utah County during his government explorations of 1859. Cedar valley was vegetated principally by sagebrush, greasewood, and rabbitbrush although the mountains were crowned with cedar and pine trees. However, he reported, "There is quite an abundance of good grass upon the bases of the mountains and in the canyons, and in some places it is to be found in patches in the valley." Government herds of beef cattle and mules were wintered in these areas. Of Cedar valley and Utah valley, Simpson reported that rain was not sufficient to sustain vegetation, hence the soil was utterly worthless for agriculture without irrigation. Despite this, he reported grass available all across Utah valley and very abundant in Provo Canyon.

These reports enable formation of rather a clear concept of original range conditions in Utah County, some of the area being very different from the present and some being but little different.

Swamp land near Utah Lake appears to have been an excellent meadow. Adjacent areas, now largely cultivated, which lie between the lake and the mountains supported bunchgrass, principally wheatgrass and ricegrass. On good deep soils these grasses were so dense as to impress greatly the early pioneers, yielding excellent hay and forage. Greasewood and sagebrush were also abundant locally. The dry hillsides where soil was shallow likewise supported bunchgrass but the density was not great. Alkaline valleys and dry valleys such as Cedar valley supported mostly desert shrubs, the grass as at present being distinctly secondary. Only in isolated areas and on the alkali-free hillsides was grass abundant.

Probably the first livestock to graze Utah County ranges were horses. The exact date of their introduction is not known but it seems likely that they were present in 1800 and certainly were abundant by 1825.

Cattle were introduced in quantity by 1850, and from then to 1890 they were the chief grazing animal. Most of these were trailed in from the east although a few came in from California (7). The first sheep were introduced many years later than the first cattle, most coming from a herd being taken from Missouri to California (2). By 1890, sheep numbers had increased greatly and unregulated grazing accompanied by keen competition for forage resulted in severe range misuse. In addition, plowing of large areas of former range land restricted grazing and so increased its intensity. Livestock populations remained high until 1930 but, during the following decade, drought and financial depression resulted in reductions in cattle and especially sheep (see table 1).

Table 1.—*Total number of cattle and sheep in Utah County, Utah from 1880 to 1940**

Date	Cattle	Sheep
	number	*number*
June 1, 1880	8,537	9,612
June 1, 1890	12,059	109,689
June 1, 1900	36,650	259,232
April 15, 1910	28,186	106,036
Jan. 1, 1920	34,555	93,888
April 1, 1930	38,313	244,513
April 1, 1940	26,718	91,801

* Data from U. S. Census

CLIMATE

UTAH COUNTY is typical of the Intermountain region climatically. Precipitation, which is the limiting factor in plant growth, varies between about 9 inches per year in the lower-elevation western portions and about 35 inches per year in the high Wasatch Mountains[6]. Intermediate foothill areas are intermediate in precipitation. Precipitation varies according to location with respect to the mountains as well as according to elevations. For example, Maplewood[7] at the foot of the Wasatch Mountains and at 4,890 foot elevation has averaged 20.18 inches precipitation. Elberta, some 25 miles westward at 4,650 foot elevation, has averaged 10.63 inches. Spanish Fork, located about 5 miles from the foothills at 4,711 foot elevation, has averaged 17.79 inches (see fig. 1).

Precipitation is distributed primarily in the winter or non-growing season (fig. 2). Approximately 42 percent falls in the growing season, April to August, inclusive, whereas 58 percent falls in October to March, inclusive. June to September, inclusive, are normally very dry.

Despite the dry climate in summer months, heavy rains of great eroding power are not unusual. Storms of 1 to almost 2 inches of precipitation are common.

Unfortunately, evaporation records are not available except for part of the year at Lehi. Here, an average evaporation of 64.8 inches has been recorded for March to October, inclusive. Such high evaporation makes low precipitation unusually serious to plant growth.

Monthly temperature averages vary from 70 to 75 degrees F. in July to about 25 degrees F. in January. Extremes are about 110 degrees maximum to –15 degrees minimum.

[6] All climatic records from the U. S. Weather Bureau.
[7] Maplewood station near Mapleton and southeast of Springville.

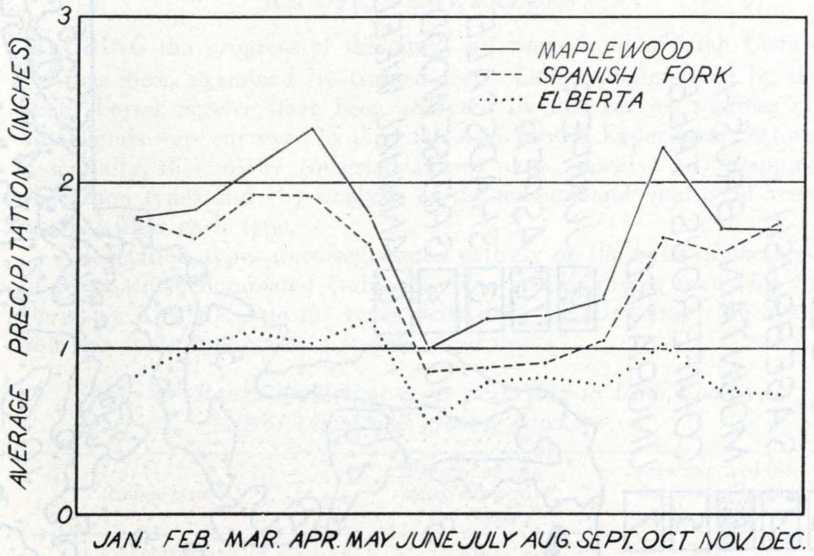

Fig. 1. Average precipitation by months for three selected weather stations in Utah County

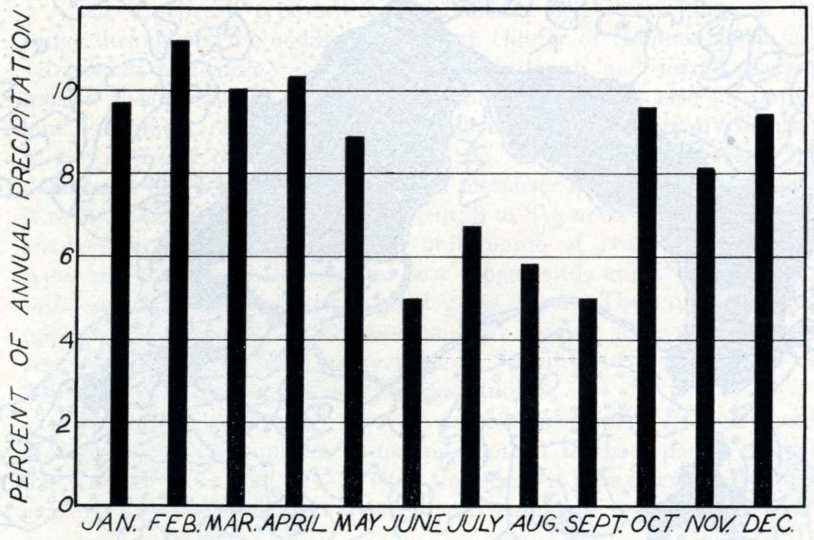

Fig. 2. Distribution of precipitation in Utah County in average percent of the annual total falling each month

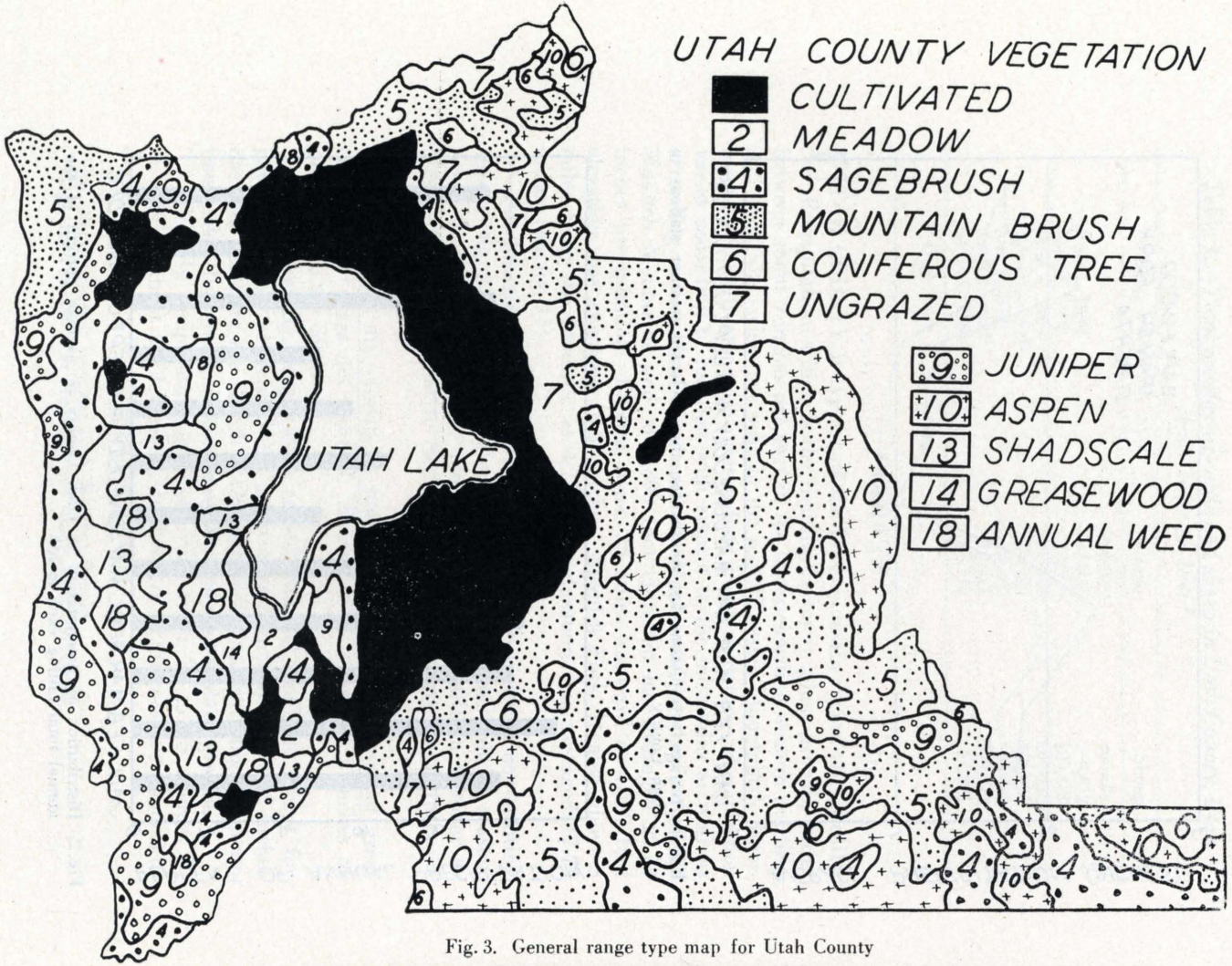

Fig. 3. General range type map for Utah County

RANGE VEGETATION

DURING the progress of this study all range land in Utah County has been examined by trained men. Lands administered by the U. S. Forest Service have been analyzed by that service whereas all other lands were surveyed by the Utah Agricultural Experiment Station. Essentially, this survey consisted of two parts, namely: (a) mapping vegetation types and (b) analysis of the amount and quality of vegetation within each type.

Vegetation types were segregated entirely on the basis of the kind of plant which dominated (table 2). The accompanying map (fig. 3) shows on a small scale the types delimited. Detailed maps are available for those interested in specific land tracts.[8]

Table 2.—*Range vegetation types occurring in Utah County, their extent and grazing capacity*

Range type	Percent of total range acreage of the country	Acres required for one animal unit month of grazing
Sagebrush	20.7	8-8½
Mountain brush	35.0	4-5
Juniper	15.1	8-10
Aspen	11.3	3
Saltbush	3.0	6-7

The sagebrush type which dominates a large percentage of the range throughout the county is made up chiefly of common sagebrush (*Artemisia tridentata*) with a little rabbitbrush and mixed grasses, mostly cheatgrass. In the dry parts, Russian-thistle is also an important constituent. As a whole, the sagebrush type was greatly misused in the past and is in poor condition (fig. 4), and, although some improvement has taken place, additional measures are necessary to return it to its optimum capacity. As a result, 8 to 8½ acres are necessary on an average to furnish an animal unit month of grazing. Sagebrush types potentially are among the best range lands and the underlying soils are capable of growing good grass cover. They offer the best opportunity for good management and for seeding since they are now very poor but potentially are very good. Sagebrush type dominates on 20.7 percent of the Utah County range land.

The mountain brush type is dominated chiefly by oak scrub (*Quercus gambelii*) and is found on foothill lands, especially along the Wasatch front (fig. 5). In Utah County, this type is generally good grazing land, although it is steep and supports vegetation of only

[8] Address Department of Range Management, Utah Agricultural Experiment Station, Logan, Utah.

Fig. 4. Sagebrush land in Utah County has been injured by drought and overgrazing. This range in western Utah County is now covered mainly by annuals, chiefly Russian-thistle. A large percent of the sagebrush is dead as can be seen by the old clumps marked now by mounds of soil drifted in by wind erosion

medium quality. It requires about 4 to 5 acres to support an animal unit one month. This type is the largest in Utah County, making up 35.0 percent of the range acreage.

The juniper type which grows on foothill lands, especially in western Utah County, is one of the poorest forage types, 8 to 10 acres being required for an animal unit month of grazing. This type is characterized by the juniper or cedar (*Juniperus utahensis*) and a sparse undercover, mostly sagebrush, Russian-thistle, and grasses. Originally, this type probably supported a much better cover of forage than at present (see fig. 14). Juniper dominates over an estimated 15.1 percent of Utah County range lands.

Aspen type makes up the largest part of the high mountain grazing and is the most important summer range type. This type is characterized by aspen (*Populus tremuloides*) although its importance for grazing arises from the excellent cover of herbs and grasses below the trees. Bluegrass, bromegrass, wheatgrass, geranium, snowberry, lupine, and bluebell are just a few of the many excellent forage plants in this type. The aspen type yields about an animal unit month of grazing from each 3 acres. It makes up 11.3 percent of the range acreage of the county.

The saltbush type in Utah County is dominated by shadscale (*Atriplex confertifolia*), which is a spiny shrub of low growth, form-

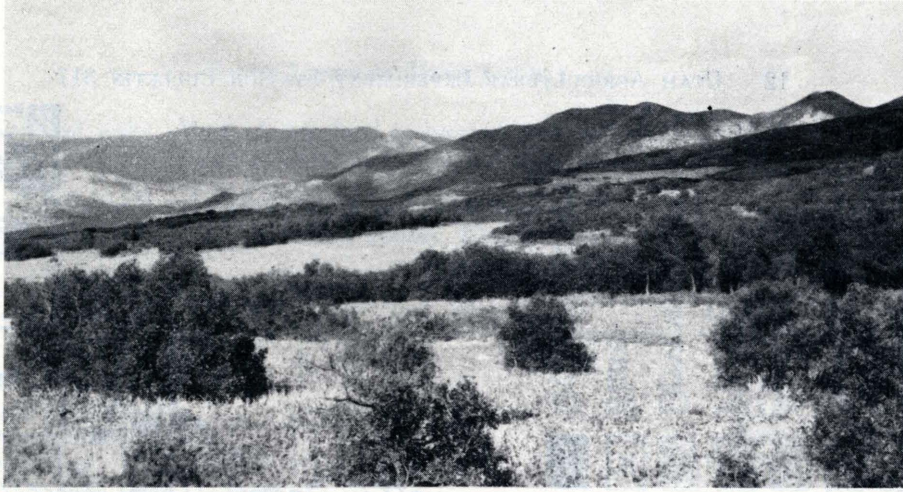

Fig. 5. The mountain brush type dominated chiefly by scrub oak

ing a very open stand (fig. 6). It is itself only a fair forage plant and the type supports only a few associated species including sagebrush, Russian-thistle, and a few grasses. It generally requires 6 to 7 acres to yield an animal unit month of grazing. It is important winter range type although it comprises but 3 percent of the total range area of the county.

LAND OWNERSHIP AND CONTROL

THE land ownership pattern in Utah County is made complex by the large acreage of federally controlled land (fig. 7). Of the 1,278,720 acres within the county, almost 50 percent is publicly owned (see table 3). The U. S. Forest Service with 453,536 acres, controls much the largest area in the county. Within the boundaries of national forests are an additional 48,561 acres of isolated units of private land administered by the Forest Service. The U. S. Grazing Service controls only about 137,743 acres mostly in small and widely

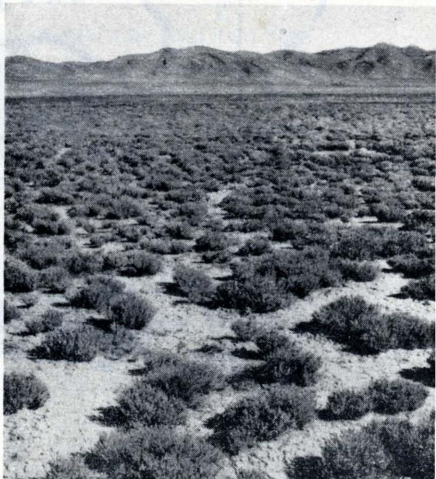

Fig. 6. The saltbush type dominated by shadscale (*Atriplex confertifolia*) forms an open stand with little other vegetation present. It is not considered a good grazing type, though it is important as winter range

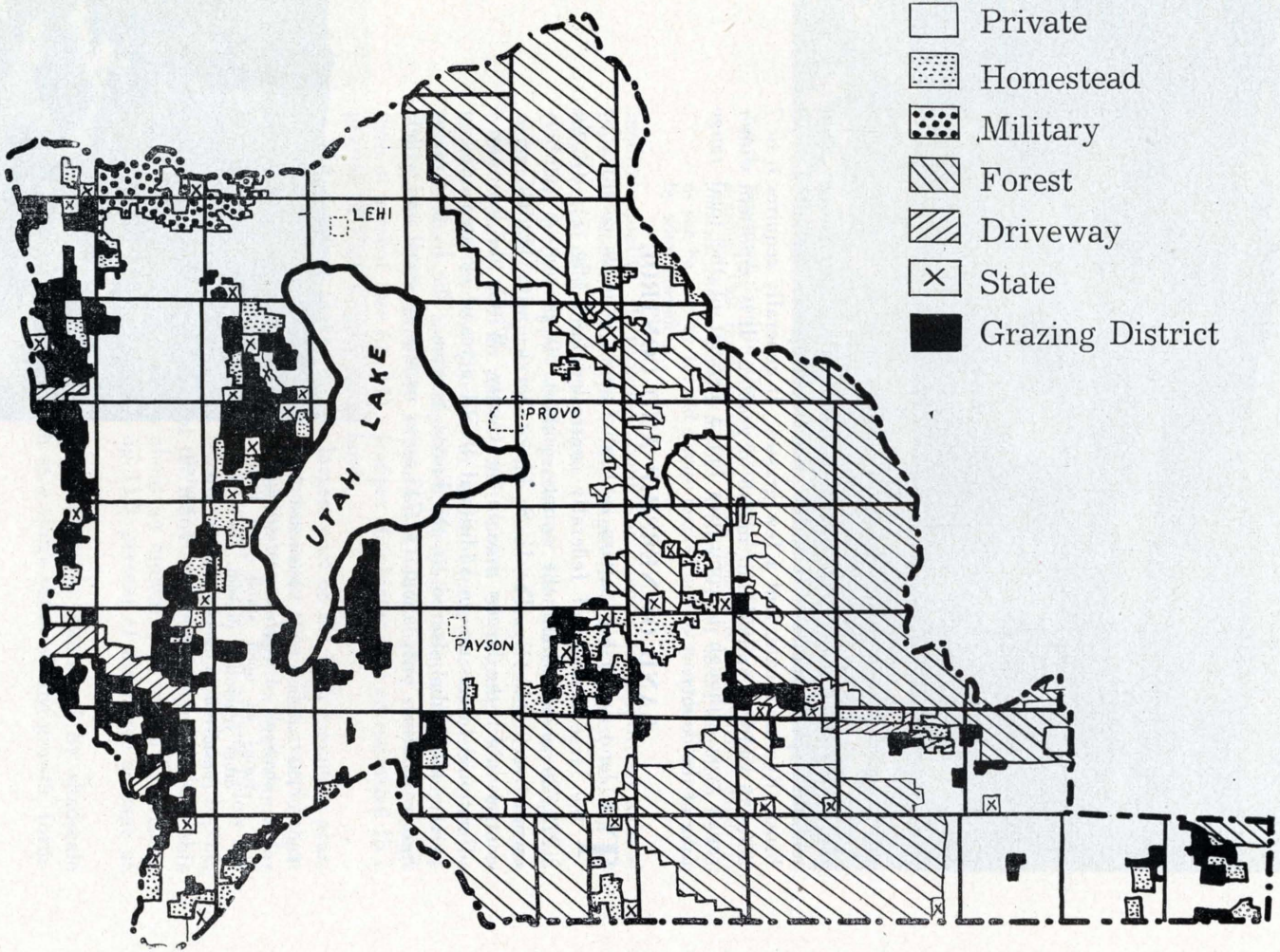

Fig. 7. Utah County land ownership map showing many small and isolated tracts of range land which are difficult to administer

scattered units. Most of this land is located west and south of Utah Lake and constitutes the least productive parts of the county.

Table 3.—*Land ownership and use classification in acres for Utah County, Utah*

Classification	acres	
Total area		1,371,720
Land	1,278,720	
Water	93,000	
Cropped land		124,403
Farm pasture land		25,515
Non-agricultural land		37,020
Range land		1,091,782
National forest		
Uinta	337,254*	
Wasatch	71,761†	
Manti	93,082‡	
Grazing district	137,743	
Military reservation	13,885	
State	25,980	
Private	412,077§	

* Includes 39,211 acres of alienated private land. (Privately owned lands enclosed by national forest boundaries.)
† Includes 7,261 acres of alienated private land.
‡ Includes 2,089 acres of alienated private land.
§ Excluding 48,561 acres of land located within boundaries of national forest.

A serious land-use problem arises from the fact that state lands, county lands, and to a lesser extent, private range lands and Grazing Service lands exist in such small tracts that they cannot be used as independent range units. Isolated pieces of land, usually unfenced, are rented or remain open to trespass use. In either event, excessive use is common. The high cost of grazing on privately owned lands compared to federally owned lands results in the leasee or even the owner grazing the land heavily in an attempt to realize a profit on his investment.

The solution to this problem is a complicated one, but two feasible approaches are apparent. The first, and perhaps most logical, is an extensive program of land exchange which would result in blocking land of a given ownership into large units, or if possible, into single blocks. These blocks could be fenced and grazed under technical supervision. Such a program would eliminate trespass use and would promote good range management practices and a maximum income. A second and simpler alternative would be that of leasing private, state, and county range lands which exist in isolated units to the U. S. Grazing Service for administration under provisions of the Pierce Act. This act, passed in 1938, has not been used to best advantages in

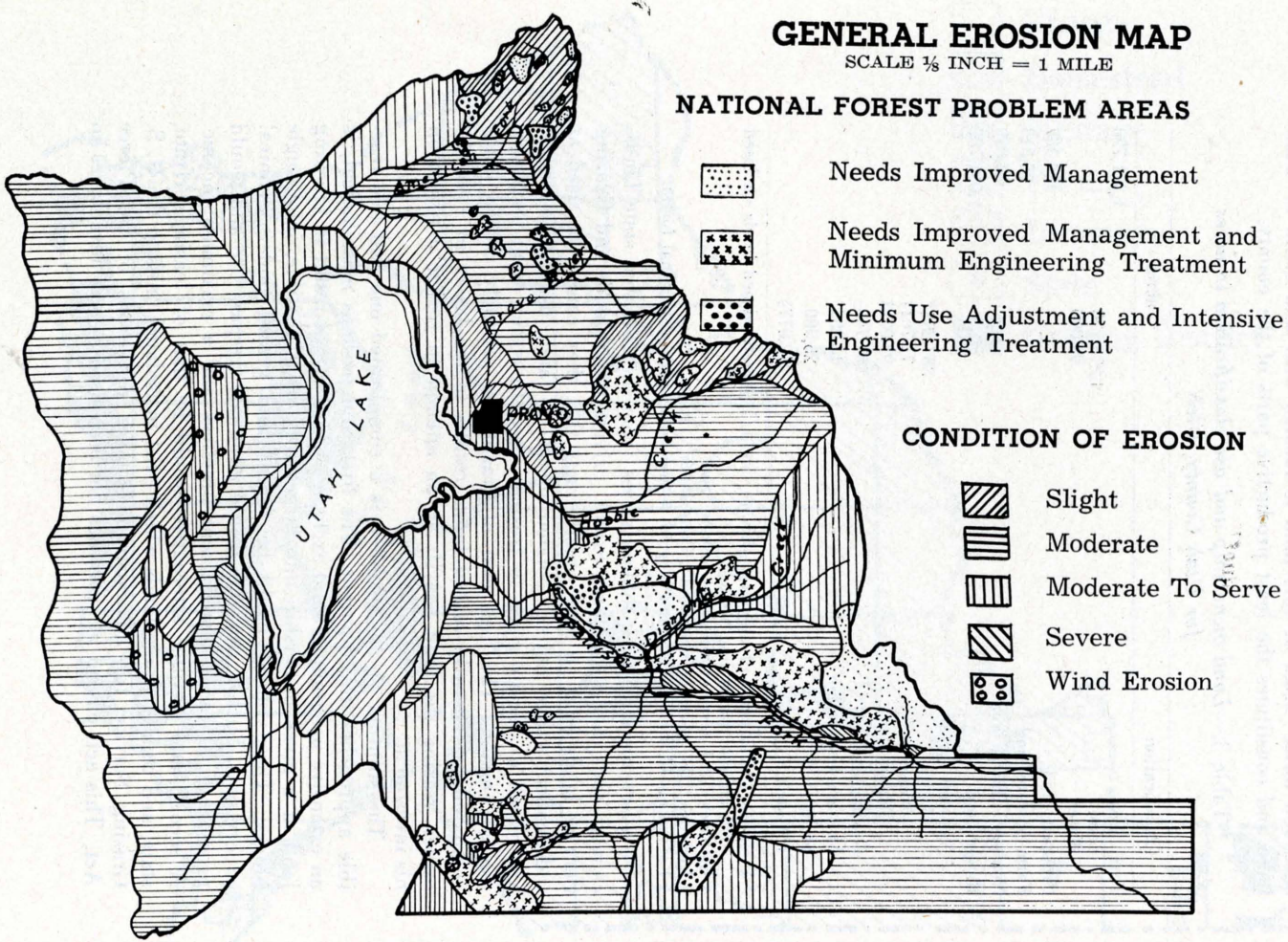

Fig. 8. General erosion condition in Utah County. Material for this map was in large part obtained from the U. S. Soil Conservation Service and the U. S. Forest Service

Utah. It provides that lands within grazing districts and suitable primarily for grazing may be leased by the federal government for administration by the Grazing Service, for periods up to 10 years. The price is determined by the grazing fees collected by the Grazing Service for the orderly use of these lands. This method of administration provides a maximum of technical supervision at a minimum cost, it assures conservative use, and results in a maximum income without the usual difficulties connected with annual rental of small and often distant tracts of land.

EROSION CONDITIONS IN UTAH COUNTY

PARTS of Utah County have suffered heavy erosion damage from both wind and water (fig. 8). Wind erosion is most severe in three areas, namely: Cedar Valley south of Fairfield, Goshen Valley south of Goshen and Elberta, and in the vicinity of the old town of Mosida on the west shore of Utah Lake. It has been estimated (7) that one-fourth of the county is in a serious stage of sheet and gully erosion, this erosion being centered mostly in Spanish Fork Canyon and along the Wasatch escarpment from Provo to Springville. Water erosion, however, is evident to some degree in most of the county. Data gathered by the Utah Agricultural Experiment Station on the range lands exclusive of national forests showed that 77.2 percent had evident sheet

Fig. 9. When small gullies such as these on the Wasatch front appear, it indicates that more severe erosion and damaging floods are in the offing unless some measure of control is forthcoming

erosion, 52.3 percent had evident gully erosion, and 21.3 percent had evident wind erosion. Of the gullied area, far the majority was marked by only occasional and shallow gullies, but these are an indication that a more serious condition will follow if some measure of control is not forthcoming (fig. 9).

Utah County's erosion problem is attributable primarily to two factors. (a) The land is subject to erosion because of the steepness of slopes, especially along the Wasatch escarpment, and because much of the soil is erosive in nature. (b) The natural vegetation which normally stabilizes the soil has been severely disturbed because of unwise plowing in areas unfit for cultivation and their subsequent abandonment, extensive trailing of livestock, and because of an excessive concentration of livestock on the spring ranges. Repeated burning of cheatgrass lands along the Wasatch front has contributed to heavy erosion in local areas.

There is but a small area in Utah County which is adapted to cultivation without irrigation water, yet thousands of acres, especially in Cedar Valley and Goshen Valley, have been plowed for dry-land wheat production. Virtually all of this land, after two or three years, was abandoned. As a result, large areas are occupied by low producing weeds which offer but little protection against the forces of wind and water (fig. 10).

Sheep Trailing

Utah County is the gateway to large areas of summer range in the Wasatch Mountains and is a natural pathway of travel between these summer ranges and the great desert ranges in Rush Valley, Skull Valley, and the Sevier desert. Nowhere in the West is there a more concentrated sheep drive than in this area, and some range damage is inevitable under such conditions (fig. 11). This situation,

Fig. 10. Large areas of land in western Utah County were plowed during times of high wheat prices and were farmed for 2 or 3 years, then abandoned and left unprotected. Wind erosion is now severe in many of these areas since the vegetation is entirely annual weeds

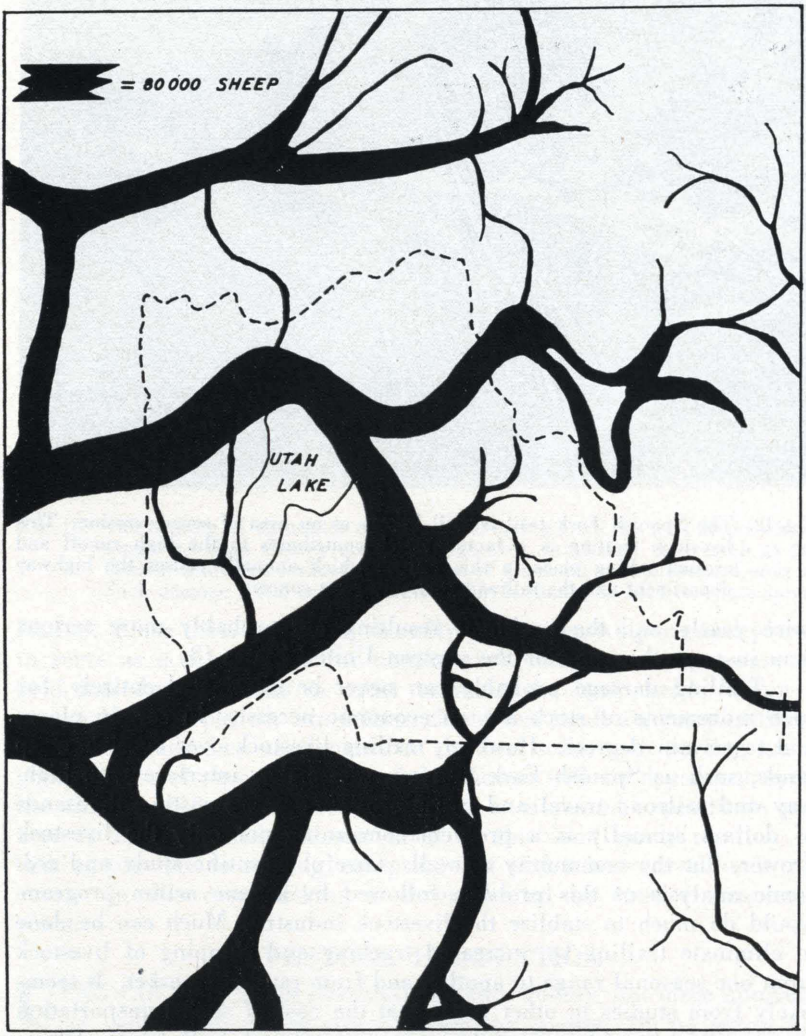

Fig. 11. Travel routes of migrating sheep in Utah County and vicinity in 1938. These include breeding herds covering definite seasonal travel routes only. After Hockmuth, Franklin, and Clawson (3)

however, has been greatly aggravated by cultivation and abandonment of land in the desert valleys where fine and, often, alkaline soils are readily blown and washed. Severe trailing damage has occurred on the Spanish Fork Canyon trail (fig. 12), the Provo Canyon trail, the Lehi trail, and the Goshen trail (fig. 13), and all are severely eroded. Between 100,000 and 150,000 sheep travel over each of these routes

Fig. 12. The Spanish Fork trail is well known as an area of severe erosion. This livestock trailing is a factor which contributes to the high runoff and erosion taking place in this canyon which annually causes the highway department and the railroad company great concern

twice yearly and the problems resulting are probably more serious than in any other part of the western United States (3).

Trailing damage probably can never be eliminated entirely, for such movements of stock are an economic necessity in certain places and to certain degrees. However, trailing livestock over erosive, steep lands, such as Spanish Fork Canyon, where they interfere with highway and railroad travel and cause erosion damage costing thousands of dollars annually is a problem concerning not only the livestock grower, but the community as well. Careful scientific study and economic analysis of this problem followed by a sane action program would do much to stablize the livestock industry. Much can be done to eliminate trailing by increased trucking and shipping of livestock from one seasonal range to another and from range to market. It seems likely from studies in other areas that the cost of such transportation may be offset by reduced weight losses and reduced death losses. Often, livestock losses are incurred by forced travel with little or no feed available, by traffic accident, and by poisonous plants which are readily consumed by hungry animals when they are being driven rapidly. Where trailing cannot be eliminated, lessened losses can be effected by fencing the trails and by feeding supplemental forage in areas of concentration where natural forage is scarce.

Erosion on abandoned cultivated lands can best be remedied by restoring perennial vegetation which alone can give complete stabil-

Fig. 13. The trailing of thousands of sheep each spring from the west-desert winter ranges to Utah County summer range over established trails such as the Goshen trail shown above is the cause of much range damage and erosion. Such damage is not easily eliminated but it should be held to a minimum

ization. Since these lands are virtually without native perennial plants to serve as a seed source for natural revegetation, it is necessary to seed introduced grasses in order to make the land usable within a reasonable time period. Since these abandoned fields are comparatively level and since they are located on the best soils, such seeding has a good chance of success. Much of the success will be dependent upon the chance of favorable weather, hence a minimum expenditure per acre is recommended. Almost none of this land needs plowing or disking previous to seeding, excepting that with a heavy weed or brush cover. In this case, disking is recommended to remove competing plants.

LIVESTOCK PRODUCTION

UTAH COUNTY is not essentially a range county, but large numbers of range livstock are owned within the county. By no means all of their forage is obtained within the county, however, since Utah-County-owned animals, especially sheep, graze elsewhere for a large percentage of the year. Also, animals owned in other counties consume much forage on Utah County farms and ranges.

In 1939, 91,801 sheep and 19,492 beef cattle were owned in the county (6), which, including young animals produced during the year, were equivalent to 35,166 animal units[9] (table 4). Other livestock,

[9] Calculated on the basis of one animal unit equivalent to 1000 pounds live weight.

Table 4.—*Estimated animal units of farm and range livestock owned in Utah County, Utah, 1939**

Kind	Number	Animal units
Sheep (over 6 mo. of age)	91,801	15,303
Lambs raised	73,440†	2,550
Cattle (over 3 mo. of age exclusive of milking dairy cows)	19,492	16,178
Calves raised	6,558†	1,135
Dairy cows in milk	7,226	9,611
Calves raised	2,489	430
Horses and mules (over 3 mo. of age)	6,554	6,554
Hogs (over 4 mo. of age)	8,818	1,390‡
Chickens (over 4 mo. of age)	403,623	4,036
Chickens raised	541,786	1,083
Turkeys (over 4 mo. of age)	1,042	31
Turkeys raised	86,806	868
Total		59,169

* Population data from U. S. Census of 1940, except as otherwise noted.
† Calculated or estimated from statistical data and field observation.
‡ Exclusive of tankage consumed.

including poultry, constituted 24,003 animal units[10]. The latter is essentially non-range livestock although horses and dairy cattle, especially dairy calves, obtain some feed from the range. Likely, however, not over 20 percent of the feed of horses and 10 percent of the feed of dairy cattle is derived from range land. It is estimated that the strictly range beef cattle receive 25.0 percent and range sheep 8.3 percent of their total feed from farm crops and pastures. Therefore, the requirement for all Utah-County-owned livestock is approximately 31,671 animal unit years or 380,052 animal unit months derived from range lands and 27,498 animal unit years or 329,976 animal unit months from farm land. It is important, however, to keep in mind that not all of this forage is obtained within the county and not all forage within the county is consumed by animals owned within the county.

FORAGE PRODUCTION

AS would be expected, Utah County, being a center of population, owns more livestock than can be supported properly on Utah County lands. The 59,169 animal units owned (table 4) require 710,028 animal unit months of forage. Since only 640,836 animal unit months of forage are now produced, assuming all grain to be available for livestock,

[10] Dairy cows = 1 1/3 animal units
Turkeys (mature) = 1/33 animal unit Young raised = 1/100 animal unit
Chickens (mature) = 1/100 animal unit Young raised = 1/500 animal unit
Pigs = 1/6.3 animal unit (excluding tankage)
Horses = 1 animal unit

there remains a deficit of 69,192 animal units months of feed within the confines of the county.

Computation shows that forage production in Utah County is equivalent to approximately 406,332 animal unit months from farm crops and 38,272 animal unit months from farm pasture (table 5). Actually, however, much of the crop produced, especially grain, is used for other purposes or is shipped to other areas. As with range land, large amounts of farm feed produced in Utah County are consumed by animals owned elsewhere. While the production is potentially more than sufficient to supply the 329,976 animal unit months of livestock feed necessary from farm lands, there is actually no excess.

Table 5.—*Estimated acreage and feed-producing capacity of all agricultural lands of Utah County, 1939*

Land type	Acres	Animal unit months
Farm pasture	25,515	38,272*
Farm crops	70,278	406,332†
Range land	1,091,782	196,232
Total	1,187,575	640,836

* Based upon U. S. Census data and a conversion factor of 1.5 animal unit months per acre.

† Based upon U. S. Census data and conversion rates calculated by the Department of Agricultural Economics, Utah Agricultural Experiment Station.

Of the 380,052 animal unit months of range forage necessary to support Utah-County-owned stock, only 196,232 (table 3) are estimated to be available within the county, leaving a deficit of 183,820 animal unit months which must be obtained outside the county.

Seasonal Balance

Of the 196,232 animal unit months of forage estimated to be available in Utah County, 117,049 are classified as summer range, 71,019 as spring-fall range, and 8,164 as winter range (table 6). Although seasonal division of range land (fig. 14) is somewhat fluctuating, the division generally is as follows:

Summer season—June 1 to July 1 until Sept. 15 to Oct. 15—3½ months.

Fall season—Sept. 15 to Oct. 15 until Nov. 15 to Dec. 15—2 months.

Winter season—Nov. 15 to Dec. 15 until March 15 to April 15—4 months.

Spring season—March 15 to April 15 until June 1 to July 1—2½ months.

Calculating seasonal balance of range resources is difficult since

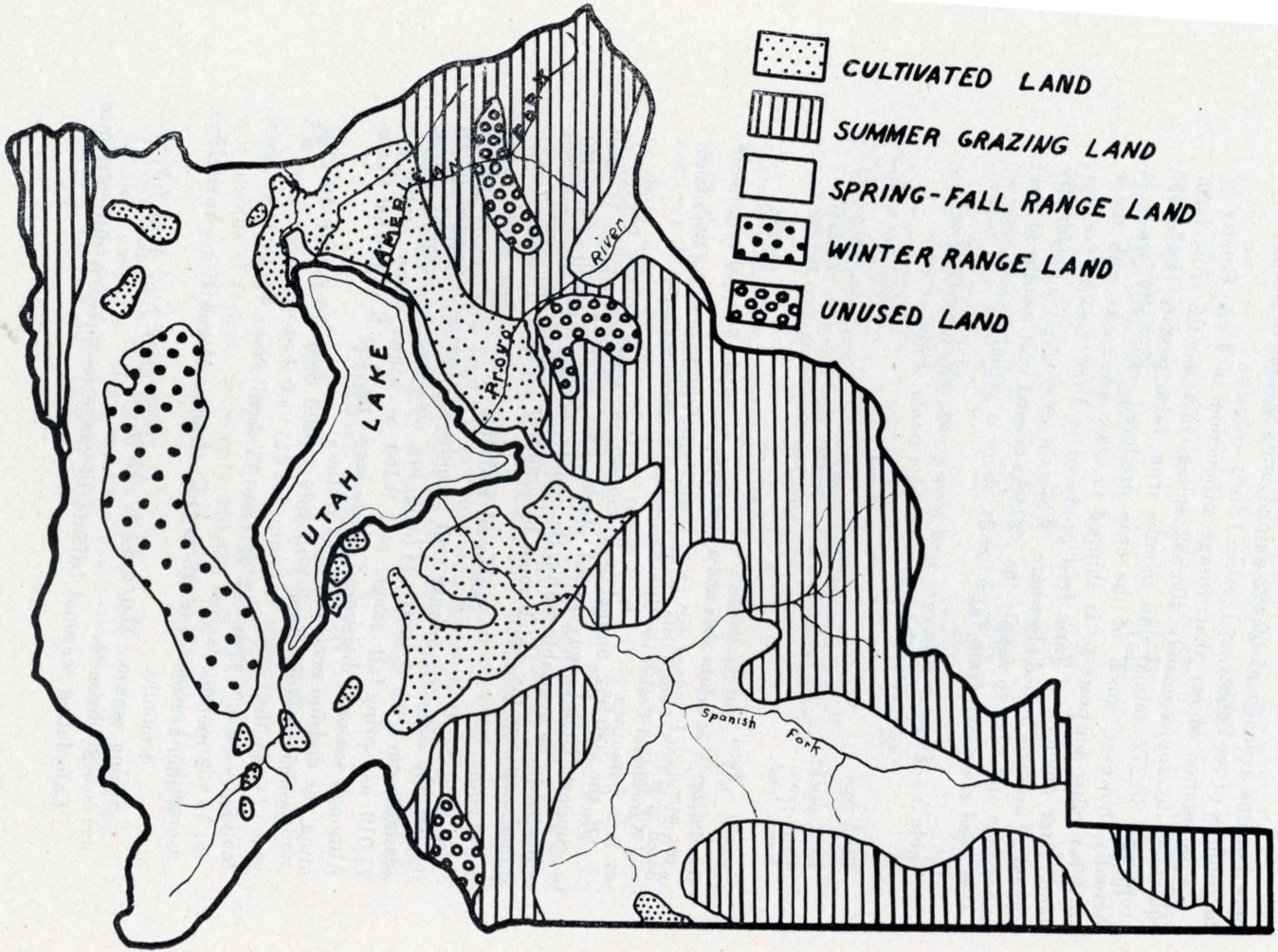

Fig. 14. Seasonal use of range lands in Utah County. The use shown on this map is, in general, the present use practice

Table 6.—*Acres and animal unit months of forage available under proper range use in Utah County, by seasons usable. Forest land data from actual use records. Non-forest land data from field survey records, 1941*

Class of land		Summer	Winter	Spring-fall	Non-use	Total
National Forest lands*	acres	404,595	0	77,484	20,018	502,097
	aum†	91,996	0	14,561	0	106,557
Non-forest range lands‡	acres	138,089	75,015	376,581	0	589,685
	aum	25,053	8,164	56,458	0	89,675
Total	acres	542,684	75,015	454,065	20,018	1,091,782
	aum	117,049	8,164	71,019	0	196,232

* Including 48,561 acres of alienated privately owned land.
†Animal unit month—feed for 1000 pound animal for one month.
‡Excluding 48,561 acres of alienated privately owned land located within the outside boundaries of national forests.

cattle and sheep differ in their demands. For example, cattle are allowed on national forest summer ranges for 3½ to 5 months, whereas sheep remain but 2½ to 3½ months. Sheep remain on grazing district winter ranges 5 to 6 months and cattle generally remain a much shorter time, depending upon farm feed supplies. Many sheep herds winter without benefit of supplemental feed although at least four out of five operators make some provision for supplements during periods of heavy snow or prolonged drought. Relatively few livestock operators feed supplements regularly when the additional feed is not absolutely necessary.

Existing range forage supply in Utah County is 59.6 percent summer range, 36.2 percent spring-fall range, and only 4.2 percent winter range. This contrasts sharply with the calculated seasonal distribution of demand (table 7).

Table 7.—*Seasonal supply and seasonal demand for range forage in Utah County*

Supply and demand	Summer	Winter	Spring-fall	Total
Range forage supply (aum)	117,049	8,164	71,019	196,232
Range forage demand (aum)	110,975	126,558	142,519	380,052
Range forage demand (percent)	29.2	33.3	37.5	100.0
Supply, excess over demand (aum)	+6,074	—118,394	—71,500	—183,820

The apparent deficit in winter range land in Utah County is not a serious one since most of the winter range demand is for sheep, which normally travel great distances between ranges. Adequate winter range is available to Utah-County-owned sheep in the great desert ranges to the west and southwest of the county, some even traveling into eastern Nevada. The deficit of spring and fall range, espe-

cially spring range, is more serious. While much of this is overcome by use of farm fields and pastures, there is an urgent need for spring range, which results in constant pressure for earlier use of late spring and summer ranges. Privately owned spring and summer land, as a result, has been used too early and too heavily almost everywhere in the county. There is a real need for developing better spring pastures and ranges and for more careful management of these lands.

RANGE PROBLEMS

UTAH COUNTY is the home of a valuable livestock industry. This industry depends upon Utah County farms and upon range lands both within and outside of the county for the feed necessary for its maintenance. Since vast areas of range land have no agricultural value except production of livestock, it is necessary to the agricultural prosperity of both the range livestock industry and related industries, especially farming, that there be a coordination of effort that ultimately will lead toward an optimum production from all county lands.

Earlier investigations in Utah County (7) pointed to five problems deserving special attention in an effort to improve range production. These were: (1) study of the best marketing age for cattle and a more definite program for sale of range livestock, (2) determination of the means of effecting increased calf and lamb crops, (3) discontinuance of range use by dairy stock, (4) improvement of the grade of range livestock, and (5) the production of more forage on farm lands. While all of these issues certainly merit study and serious consideration, it is necessary to add to the list a study of the range resource and its management to increase productivity. The object of range management is to increase the meat and wool yield from the land and to so regulate land use as to effect a maximum yield over a long-time period. If range management and range conservation do not result in economic production, then they fail in their purpose.

Proper Stocking

Proper livestock numbers is the first fundamental of good range management. Too many animals bring about deterioration of the vegetation resulting in species poorer in both nutritive value and soil protection value. Usually there also is a decrease in the amount of vegetation produced. As a result of this forage plant decline, animals gain less, reproduce less efficiently, and require more supplemental feed.

There is indication both in the condition of the range vegetation and in the range capacity studies conducted in Utah County that there

is a tendency toward overstocking both on foothill spring ranges and on the great semi-desert valleys in the western part of the county. Surveys indicate that Utah County winter range lands have an average capacity of one animal unit month of grazing per 9.2 acres, whereas on spring-fall lands 6.7 acres are required and, on summer range lands, 5.5 acres. These figures apply only to lands other than national forests, upon which 4.7 acres are required per animal unit month.

It is estimated that the county ranges now support slightly over 10 percent too many animals (table 8). Excluding national forest

Table 8.—*Range forage estimated to be used by livestock in Utah County by acres and by class of land, 1942*

Class of land	Area	Range required per animal unit month	Grazing capacity
	acres	*acres*	*animal-unit-months*
National forest*	502,097	4.71	106,557
State	25,980	6.00	4,330
Private†	412,077	5.00	82,251
Grazing district	137,743	6.00	22,957
Other federal	13,885	6.00	2,324
Total or average	1,091,782	5.00	218,419

* Including 48,561 acres of alienated privately owned land.
† Excluding 48,561 acres of alienated privately owned land located within the outside boundaries of national forests.

ranges, which are believed to be stocked about correctly despite local overgrazing resulting from improper livestock distribution, the remaining range lands are considered slightly less than 20 percent overstocked. These estimates do not imply that all lands are so overstocked, for many areas are considered correctly used. Many ranges, however, are greatly overstocked and need immediate attention. These may be recognized by active erosion from water and wind, large infestations of annual plants and dying of perennial grasses and shrubs, and by poor livestock condition and performance. Almost all land is capable of producing a good stand of vegetation under proper management (fig. 15), and observation of vegetation on adjacent areas and small inaccessible spots may give ranchers some information as to just what a given piece of land is capable of supporting.

Range Development

In order to use range lands most efficiently they should be well watered and, often, fenced. Water should be located every 2 or 3 miles on steep lands such as characterize eastern Utah County and every 4 to 5 miles on relatively level lands. Where snows are relatively

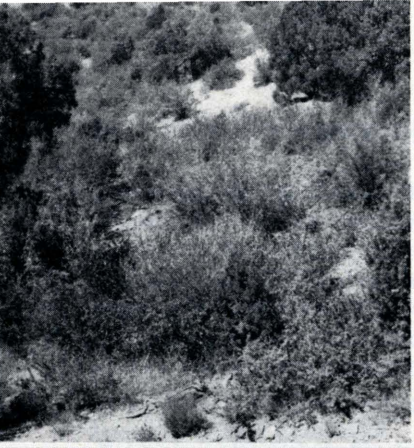

Fig. 15. Grazing lands owned by the Tintic Standard Mining Company have had restricted use for many years and excellent stands of both grass and browse plants have resulted. These lands are usually grazed about a month in the fall and two months in the spring, the animals being well scattered and restricted in numbers

dependable, they can serve as a source of water on winter ranges, but generally, a dependable development is more preferable.

The ranges in Utah County are fairly well watered, however, there is need for further development of springs in the mountain spring and summer ranges and further development of wells or reservoirs should be undertaken in the winter and spring ranges west of Utah Lake. These developments would permit a more uniform use of the vegetation and would thus actually increase the grazing capacity of the land.

Fencing land is the only way to insure an orderly use of cattle range. By extensive fencing, a greatly increased control would be possible in spring movement of stock in mountainous areas such as the upper Spanish Fork and Provo Canyon ranges. Orderly use of cattle ranges in Goshen Valley could be enhanced by a studied fencing program. It is probable that such projects, and indeed, extensive fencing programs in other areas, would prove economically sound because of reduced trespass and increased control over livestock distribution.

The most important factor influencing production of livestock is good and adequate feed. While good quality of livestock is also important, even the best livestock cannot produce without good feed. Range animals are able to live throughout the year on range lands without supplement except during emergency snow periods. However, in order to keep an optimum production under these circumstances, it is necessary to have good range conditions. Correct stocking and good seasonal regulation are prerequisite. Where spring-fall range is deficient, as is true in Utah County, farm pasture and forage crops are essential to correct range use. Otherwise, either summer ranges must

be grazed too early or spring ranges must be overused. Good feed from well managed ranges or from farm land will result in maximum lamb and calf crop, maximum weight gains, and maximum wool yield.

Increasing Livestock Feed

Perhaps the greatest advance in feed production could be made by planting to forage grasses large areas of abandoned farm land, low-producing farm land, and better sites of range land now producing below normal because of misuse. These lands are generally not steep lands, hence use of large machinery is possible which results in low cost per acre. Plowing range land steeper than about 10 to 20 percent for seeding is not recommended because of the erosion danger involved. Abandoned farm lands need disking or plowing previous to seeding only in the event that weed competition must be removed. This is necessary usually, only in seeding cheatgrass (*Bromus tectorum*) land. Seed should be drilled as shallowly as possible to insure proper coverage. Plowed land should be allowed to settle for several weeks before it is drilled to avoid placing the seed too deep. On sagebrush range land which has been plowed, broadcasting seed immediately after the plowing has proved satisfactory in some cases. Present experience points to crested wheatgrass (*Agropyron cristatum*) as the best species for low-elevation ranges in this area. Seeding about 5 pounds per acre of this species alone probably offers the greatest likelihood of success with a minimum of cost. Seeding in the fall of the year has proved most successful. It is important that such plantings be protected from grazing for two full years and that thereafter, grazing be conservative enough to prevent depletion of the grass.

As a temporary forage crop on relatively level land, fall rye seeded alone should give excellent yields on better sagebrush sites in Utah County.

Farm Pastures

Farm pasture lands at present contribute an estimated 38,272 animal unit months of forage. Much of this production is from natural grasslands adjacent to Utah Lake, especially east and south of the lake. The vegetation in these meadows is largely saltgrass (*Distichlis*) in the alkaline areas, and sedge (*Carex*) in less alkaline areas. Farm pastures in Utah County, especially upland pastures, are generally in deplorable condition. Low value grasses and worthless weeds dominate hundreds of farm pastures. Such conditions have originated usually from overuse. There seems to be a general feeling that pasture land can absorb any number of animals and at any season convenient to the operator. This land is capable of making a

great contribution to the agriculture of the county if properly managed. The productivity of these lands, now only 1.5 animal unit months per acre, could be increased greatly by a program of fertilizing, and, in many instances, replanting. Increasing the productivity of these areas and improving management would enable better balance in seasonal use of the range lands and deferred use on spring ranges. Animals wintered in Utah County on native meadow hay or on pasture, especially saltgrass pasture, show beyond doubt by their emaciated condition that these dry grasses are an insufficient diet unless supplemented by protein concentrates. Cattle, trailing from Utah County bottomland to the spring and summer ranges, are generally in a condition that defies normal production. Low calf crop, high death loss, and low calf gains caused by insufficient milk supply are inevitable when animals are allowed to winter at this low level of nutrition. When not too wet, use of spring pastures for lambing should prove a good practice in many instances, and would effect a much improved condition on spring range land.

Farm-feed Production

Farm lands, exclusive of farm pastures, are now estimated to produce crops which, if used for livestock forage, are equivalent in value to 135,444 tons of alfalfa hay (table 9) which is estimated to be equivalent to 406,332 animal unit months of forage (fig. 16).

While this land could be made to produce a great deal more livestock forage, there is some question in the over-all economy of the county as to whether an increased forage crop acreage is desirable. Forage crops do not contribute as greatly to a populated agricultural center as do many other kinds of crops in terms of labor employed or income derived. Only slight increase in forage production from cropped land seems feasible and this would need to result from increased efficiency rather than from any great increase in forage acreage.

Fig. 16. Forage production on Utah County farms plays a vital role in the livestock industry by balancing the livestock feeding program

Table 9.—*Farm forage exclusive of pasture produced in Utah County, Utah, 1939**

Farm forage	Bushels	Bushels to equal one ton of alfalfa	Grain production in tons of alfalfa hay equivalent
Grain:			
Barley	451,914	27.1	16,676
Corn	27,923	22.6	1,235
Oats	112,973	45.8	2,467
Rye	1,682	22.8	74
Wheat	387,196	21.1	18,351
Mixed grain	27,571	27.9†	988
	1,009,259		39,791

	Tons	Tons to equal one ton of alfalfa	Hay production in tons of alfalfa hay equivalent
Hay:			
Alfalfa	66,960	1.0	66,960
Annual legume	392	1.0†	392
Clover and timothy	626	1.5	417
Small grain	378	2.0	189
Sweet clover	844	1.5†	127
Wild hay	9,330	1.5	6,220
Other tame hay	725	1.5†	483
	79,255		74,788

	Tons	Tons to equal one ton of alfalfa	Other feed production in tons of alfalfa hay equivalent
Other feeds:			
Corn silage	10,119	2.5	4,043
Corn stover	6,973†	4.0	1,743
Beet tops	30,433†	7.0	4,348
Beet pulp (wet)	18,260†	5.0	3,652
Aftermath:			
beet	.....	....	1,735
grain	.....	....	1,539
hay	.....	....	3,805
Total			20,865
Total production in alfalfa hay equivalent:			135,444

* Production data from the U. S. Census, 1940, and feed value conversion factors from the Department of Agricultural Economics, Utah Agricultural Experiment Station. These data are based upon the year 1939 and would vary from year to year. The data do not take into consideration carryover of feed from year to year which tends to reduce annual variations. There is much import and export of feeds within a single county, hence this production does not represent forage actually available for animals within the county.

† Calculated or estimated.

It is very likely that material increase could be made in range forage yield by improved distribution of livestock through water development, fencing, salting, and careful herding. Proper livestock numbers have been shown repeatedly to result in increased forage production. It is entirely possible that careful stocking of range land in Utah County for a period of years will result in improved forage production and, ultimately, will enable even larger numbers of livestock than at present to graze the ranges.

Poisonous Plants

Poisonous plant problems are not serious in Utah County. The most dangerous plant appears to be low larkspur (*Delphinium*) on certain foothill ranges. This problem is by no means general and is rather easily overcome by deferring grazing until other and more preferred plants are available to grazing animals. Arrowgrass (*Triglochin*) causes occasional losses in pasture and hay fields adjacent to Utah Lake. These losses, however, appear to be diminishing with improved management and likely the amount of arrowgrass is decreasing with improved land drainage. It does not now constitute a serious problem. Locally, losses occur from other poisonous species including chokecherry (*Prunus*), oak (*Quercus*), and death camas (*Zygadenus*) but the loss is not believed sufficient to justify extensive control measures.

Big Game Problems

Deer are abundant throughout the mountainous parts of Utah County. It is estimated that approximately 8,400 deer and 400 elk spend the year within the county. It is estimated that these animals use the equivalent of 20,000 animal months of forage. While not all of this would otherwise be available to domestic stock, some of it would, and it constitutes a conflict in use. Only on the foothill areas used by deer during the winter and spring is this herd considered too large for the best interests of the community. Much of the front of the Wasatch range is, in any event, unused by domestic stock because of the steepness of topography. Deer concentration on private spring range, farm lands, and erosive foothills during the winter and spring because of lack of adequate winter range is a distinct problem in Utah County.

SUMMARY

Utah County is not primarily a "range" county but the importance of range land in this and adjacent counties makes livestock production one of the major concerns of agriculture in the county. Although winter range is not abundant, the summer ranges are large and productive and the spring-fall ranges cover thousands of acres

and are of vast importance to the agricultural economy of central Utah. Farm lands produce feed equivalent to over 135 thousand tons of alfalfa hay, most of which is used by livestock. Without the support of these farm lands, range livestock production would be seriously hampered.

Approximately 92 thousand sheep and 20 thousand beef cattle are owned in Utah County and these derive a large part of their feed from the more than one million acres of range land in the county. This land can produce on a sustained yield basis over 196 thousand animal unit months of forage, 117 thousand in the summer, 8 thousand in the winter, and 71 thousand in the spring and fall. It is possible by careful management and by thoughtful attention to the problems of the range to maintain this great natural resource at its present productivity or at even higher levels.

Some of the major problems in need of attention and scientific study in Utah County follow:

(1) Range lands are now owned or operated by many federal agencies, corporations, and private individuals, and they exist in many small and isolated tracts. Small units result in costly administration and seriously poor land management and conservation. This land should be blocked into large units for efficient administration or it should be placed under controlled use by leasing to agencies now established for that purpose.

(2) Erosion of range land and flooding from excessive runoff on range land are causing serious problems locally and, under continued land misuse, threaten to become even more serious and more widespread. This evil can be controlled by seeding abandoned farm lands and misused range land now being eroded by wind to perennial grass which later would become an important source of livestock feed. In addition, erosion and flooding, especially in mountain canyons, can in large measure be controlled by elimination of concentrated sheep trailing through increased trucking and shipping or by fencing trails and feeding livestock enroute.

(3) Proper livestock numbers are fundamental to range conservation. There is indication in both range survey and vegetation study that Utah County ranges, excluding land in national forests, are about 20 percent overstocked. Since maximum production from range land is obtained by correct stocking, a conscientious effort on the part of ranchers to adjust livestock numbers to the capacity of the land is justified.

(4) Range land, like farm land, can be made to produce more and can be made to require less labor in operation by adequate improvement and development. Utah County ranges are in need of

water development and fence construction in many areas and it is believed that this work will not only prove economical in dollars and cents but that it will serve to increase the productive capacity of the land.

(5) Utah County has a problem in big game management that is in need of investigation. Spring ranges and early summer ranges, especially, are being damaged somewhat by elk and deer. These animals are concentrated on an area of inadequate feed supply during winter months and they are causing damage to ranges normally used by livestock through overuse and unseasonal use. Locally, game animals are too abundant for the winter feed resources even if livestock were entirely removed.

(6) The major problem facing Utah County livestock growers is that of obtaining adequate high quality feed for maintaining animals in good production. The most economical lamb and calf crop, weight gains, and wool yields can be obtained by supplying adequate good feed to the animals.

(7) Methods of increasing feed supplies are seeding abandoned farm land and low producing farm and range land to perennial grass; improving range management by correct livestock numbers, adequate control of seasonal movement, and attention to obtaining good animal distribution on the range; improving farm pasture by good management, draining, fertilizing, and seeding; and by increasing the yield of forage crops on farm land by use of improved crops and methods so that these lands can be used to support and give versatility of use to range lands to the greatest extent possible consistent with the best agricultural economy of the county.

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